

# New subspecies for *Zieria odorifera* J.A.Armstr. (Rutaceae) from northern New South Wales

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## Summary

Duretto, M.F. & Forster, P.I. (2008). New subspecies for *Zieria odorifera* J.A.Armstr. (Rutaceae) from northern New South Wales. *Austrobaileya* 7(4): 681–690. Three new subspecies of *Zieria odorifera* endemic to northern New South Wales are described and illustrated, these being: subsp. *copelandii* Duretto & P.I.Forst., subsp. *warrabahensis* Duretto & P.I.Forst. and subsp. *williamsii* Duretto & P.I.Forst. A key to the four subspecies of *Z. odorifera* is provided.

Key Words: Rutaceae, *Zieria*, *Zieria odorifera*, *Zieria odorifera* subsp. *copelandii*, *Zieria odorifera* subsp. *odorifera*, *Zieria odorifera* subsp. *warrabahensis*, *Zieria odorifera* subsp. *williamsii*

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## Introduction

*Zieria* Sm. (Rutaceae) contains *c.* 60 species restricted to eastern Australia (Queensland, New South Wales, Victoria, South Australia and Tasmania) and one species, *Z. chevalieri* Viot, which is endemic to New Caledonia (see Armstrong 2002; Duretto & Forster 2007).

Two species were identified in the *Flora of New South Wales* under the phrase names *Zieria* sp. ‘Cathedral Rock’ (Williams 95303) and *Z.* sp. ‘Oxley Wild Rivers N.P.’ (Copeland 2174) (Armstrong & Harden 2002). In anticipation of the forthcoming account of the genus for the *Flora of Australia* these informal taxonomic concepts were evaluated. Both concepts were found to be conspecific with *Z. odorifera* J.A.Armstr. and represent variants of a new subspecies which is described below, along with two other new subspecies. These four subspecies form a geographic replacement series throughout the overall species range and can be viewed as representing distinct regional elements in the process of speciation via isolation and local genetic drift. The subspecies are distinct in character combinations predominantly

composed of indumentum type and cover and the size of some foliar and floral characters.

## Materials and methods

This paper is based on herbarium collections housed in BRI, CANB, MEL, NE and NSW. Our descriptions follow the format used by Duretto & Forster (2007).

## Taxonomy

The key to the species of *Zieria* found in New South Wales (Armstrong & Harden 2002) requires amendment to accommodate all taxa found in this state. For example, with *Z. odorifera* the key (p. 278: Group 3, couplet 4), and later the description of the species, indicate that the fruit is pubescent or hirsute, though many of the specimens Armstrong (2002) cites in the protologue have glabrous fruit. In addition, some specimens have stellate hairs dominating the indumentum of the stems and so belong to Group 4 of Armstrong & Harden (2002) and thus will not key out to *Z. odorifera*. To key out *Z. odorifera* in the *Flora of New South Wales* the following couplets need to be inserted.

**Zieria Group 3** (Armstrong & Harden (2002, p. 278)

- 3\* Petals white or rarely white with pink tips; inflorescence mostly 1–3-flowered, shorter than or longer than leaves . . . . .
- 4 Abaxial surface of sepals glabrous . . . . . **11. Z. adenophora**
- 4\* Abaxial surface of sepals variously hairy . . . . .
- 5 Leaflets cuneate-obovate to obovate, margins flat to slightly recurved; petals 2–2.5 mm long . . . . . **12. Z. obcordata**
- 5\* Leaflets narrow elliptic to narrow oblanceolate to oblanceolate, margins slightly recurved to revolute; petals 2–4.5 mm long . . . . . **8. Z. odorifera**

**Zieria Group 4** (Armstrong & Harden (2002, p. 279)

- 2\* Lower surface of leaflets glabrous or hirsute, but never velvety . . . . .
- 10a Leaflets usually < 3.5 mm wide; petioles < 6 mm long . . . . .
- 10b Petioles 1–1.5 mm long; leaflets 2.5–5 mm long . . . . . **8. Z. odorifera**
- 10b\* Petioles 4–6 mm long; leaflets 17–25 mm long . . . . . **23. Z. floydii**
- 10a\* Leaflets mostly 4–7 mm wide; petioles 8–20 mm long . . . . . **24. Z. smithii**

**Zieria odorifera** J.A. Armstr., *Austral. Syst. Bot.* 15: 412 (2002). **Type:** New South Wales. NORTH WESTERN SLOPES: Warrumbungle Range, Burrumbuckle Rock, 8 November 1977, *M.D. Crisp 3609* (holo: CANB [CBG7707801]; iso: NSW 455488).

Erect to prostrate, sometimes spindly, shrub, to 1 m tall. Branches not or weakly to strongly glandular verrucose, sparsely to densely pilose with mainly simple and bifid hairs, or stellate hairy, hair distribution even, rarely concentrated between decurrent leaf bases which are poorly developed or absent. Leaves palmately trifoliolate, strongly odoriferous, glabrescent to pilose; petioles 1–2 mm long, not or weakly to strongly glandular verrucose; terminal leaflets narrow elliptic to narrow oblanceolate to oblanceolate, 2.5–10 × 1–5 mm, tips obtuse to acute, margins slightly recurved to revolute, smooth to glandular dentate, midrib raised abaxially and not to strongly glandular verrucose, adaxial surface not or strongly glandular verrucose; lateral leaflets similar to terminal leaflets though usually smaller. Inflorescence axillary, shorter to longer than the subtending leaves, 1–3(–12)-flowered; peduncle 1–7 mm long, not or weakly glandular verrucose, pilose with simple, bifid and trifid hairs or sparsely

stellate hairy, often hairs concentrated between decurrent bract bases; bracts narrow-elliptic to narrow-lanceolate, persistent, 1–4 mm long, leaflet-like; pedicels 1–5 mm long, with a sparse to moderately dense indumentum of stellate and/or bifid and/or simple hairs. Sepals ovate-deltate to deltate, 1–2 × 0.7–1.5 mm, slightly imbricate in bud, not or weakly glandular verrucose, tips acute or rarely slightly acuminate, adaxial surface glabrous or sparsely pilose, abaxial surface glabrous or variously hairy. Petals elliptic, 2–4.5 × 1.2–2.5 mm, white to pale pink, slightly imbricate in bud, not obviously glandular or with a few obvious glands near tip, adaxial surface glabrous to sparsely pilose, abaxial surface with a dense indumentum of mainly minute stellate hairs or glabrous. Staminal filaments 0.75–1.2 mm long, glabrous, smooth; anthers 0.5–0.8 mm long, apiculum absent or minute. Gynoecium glabrous or hirsute. Cocci 3–3.5 mm × 1.75–2.5 mm, smooth to slightly glandular verrucose, glabrous or with a sparse to dense indumentum of simple, bifid and/or stellate hairs, base of style sometimes persistent forming a minute apical apiculum. Seeds 2–2.5 × 1–1.5 mm, black, striate, with white material between striations.

**Distribution and habitat:** *Zieria odorifera* is endemic to New South Wales and occurs in rocky areas from Kaputar N.P. and the Inverell area east to Cathedral Range N.P. and south to Warrumbungle N.P. with isolated

occurrences further south near Mendooran and Molong. The species is usually found in rocky situations in heathland, shrubland and woodland.

### Key to subspecies

- 1 Petals glabrous or glabrescent on abaxial surface . . . . . subsp. **copelandii**
1. Petals densely hirsute on abaxial surface . . . . . 2
- 2 Branches with an indumentum of mainly stellate hairs; sepals *c.* 1 mm long, glabrous or with a sparse indumentum of stellate hairs on the abaxial surface . . . . . subsp. **warrabahensis**
2. Branches pilose, with no or few stellate hairs; sepals 1–2 mm long, variously pilose on the abaxial surface though a few stellate hairs may also be present . . . . . 3
- 3 Petals 4–4.5 mm long [though smaller petals *c.* 3.5 mm long may rarely be also present]; leaflets usually oblanceolate with smooth or slightly glandular dentate margins . . . . . subsp. **odorifera**
3. Petals 2–2.5(–3.5) mm long; leaflets usually narrowly elliptic or narrowly oblanceolate with margins slightly to prominently glandular dentate . . . . . subsp. **williamsii**

***Zieria odorifera*** J.A.Armstr. subsp. **odorifera**

**Illustrations:** Armstrong (2002: 412, 413); Armstrong & Harden (2002: 282) [as *Z. odorifera*].

Erect or spreading shrub, to 1 m tall. Branches moderately densely to densely pilose, with mainly simple and bifid hairs. Leaves pilose; petioles 1–2 mm long, not or weakly glandular verrucose; terminal leaflets narrow elliptic to narrow oblanceolate to oblanceolate, 3.5–10 × 2–5 mm, margins smooth to slightly glandular dentate, adaxial surface not or slightly glandular verrucose. Inflorescence usually longer than the subtending leaves, 1–3(–7)-flowered; peduncle 1.5–7 mm long, pilose with simple, bifid and trifid hairs; pedicels 1–5 mm long, with a moderately dense indumentum of mainly stellate and bifid hairs. Sepals 1.5–2 × 1.2–1.5 mm, abaxial surfaces minutely pilose, sometimes with bifid and stellate hairs as well. Petals (3.5–) 4–4.5 × (1.7–) 2–2.5 mm, adaxial surface sparsely pilose, abaxial surface with a dense indumentum of mainly minute stellate hairs. Ovary hirsute; style hirsute at base. Cocci smooth, with a sparse

to dense indumentum of simple, bifid and/or stellate hairs or rarely (Mt Bulga) glabrous.

**Additional specimens examined:** **New South Wales.** NORTH WESTERN SLOPES: Summit of Mt Bulga, May 2003, *Lewer & Chaffey s.n.* (NSW); Walking track to Belougery Split Rock, Warrumbungle N.P., Oct 1993, *Johnstone 414 & Burrell* (MEL); Warrumbungle N.P., Oct 1964, *Vickery & Fraser s.n.* (NSW); Split Rock, 24 km NW of Coonabarabran, Dec 1973, *Streimann s.n.* (CANB, NSW); Burbie Spring to Ailinn Plateau, Warrumbungle N.P., Oct 1974, *Harden s.n.* (NE); Belougery Split Rock, Warrumbungle N.P., Oct 1974, *Harden s.n.* (NE); Warrumbungles Range, Sep 1966, *Frazer s.n.* (NE); Warrumbungle Mts, May 1946, *Althofer 89* (NSW); 2.3 km E of Burrumbuckle Rock, Warrumbungle N.P., Oct 1978, *Crisp 4345* (CANB); Mt Wombelong, Warrumbungle N.P., Dec 1973, *Streimann s.n.* (CANB). CENTRAL-WEST SLOPES: near Mendooran, Sep 1945, *Althofer & Dripstone 40* (MEL); *c.* 9 km (direct) of Molong, Bocoble Gap, Oct 1992, *Makinson 1196* (BRI, CANB, MEL, NE, NSW).

**Distribution and habitat:** *Zieria odorifera* subsp. *odorifera* appears to be widespread in Warrumbungle N.P. In addition, three isolated collections have been made outside the park area to the north at Mount Bulga, and south near Mendooran and Molong. The subspecies is found in heath, shrubland and low eucalypt woodland on sandstones and trachyte, often in rocky situations.

**Phenology:** Flowers have been collected from September to December, and fruit from October to December.

**Notes:** The material from Mount Bulga differs from the remaining material of this subspecies in having glabrous fruit and leaves that are slightly more glandular verrucose. Hair density on the fruits is quite variable in material from elsewhere with the type having sparse indumentum on the fruit, while some other specimens have a dense indumentum. The fruit of *Zieria odorifera* subsp. *williamsii* may also be glabrous to densely hirsute so the taxonomic value of this character is questionable with such a small sample size. Only one plant was recorded on Mt Bulga at the time of the collection and so further field research is required to determine if the variation noted warrants taxonomic recognition.

**Conservation status:** Few collections have notes on population size though a few collectors (e.g. *Crisp 3609*, *Johnstone 414* & *Burrell, Makinson 1196*) noted that the taxon was rare. *Zieria odorifera* subsp. *odorifera* has been mainly found in Warrumbungle N.P. though its abundance there is unknown at this stage. Surveys are required to ascertain the size and extent of the known populations and the area of occupancy, prior to making a conservation assessment; however, a provisional assessment would be Least Concern (IUCN 2001).

***Zieria odorifera* subsp. *copelandii*** Duretto & P.I.Forst., **subspecies nova** a subspecies typica petalis sepalisque glabris differt. **Typus:** New South Wales. NORTH WESTERN SLOPES: Mount Kaputar National Park, 5 October 2002, *L.M.Copeland 3432* (holo: NE 80023A; iso: BRI, CANB; NSW *n.v.*).

Erect shrub to 20 cm tall. Branches with a sparse indumentum of simple, bifid and stellate hairs. Leaves with a few simple hairs on midvein and/or margin; petioles 1–1.5 mm long, weakly glandular verrucose; terminal leaflets narrow elliptic to narrow oblanceolate to oblanceolate, 5–8.5 × 1.5–3.5 mm, margins entire to slightly glandular dentate, adaxial surface not glandular verrucose. Inflorescence usually *c.* equal to subtending leaves, 1–3(–7)-flowered; peduncle 3–7 mm long, pilose with

simple, bifid and trifid hairs concentrated between decurrent bract bases; pedicels 1.5–3.5 mm long, with a sparse to moderately dense stellate indumentum. Sepals 1–1.5 × 1–1.3 mm, abaxial surfaces glabrous or with few stellate hairs towards base. Petals *c.* 3.5 × 1.7 mm, adaxial surface glabrous or glabrescent, abaxial surface glabrous or with a few hairs near margins. Gynoecium glabrous. Cocci smooth, glabrous. **Fig. 1.**

**Additional specimens examined:** New South Wales. NORTH WESTERN SLOPES: 33 km from Narrabri to Mt Kaputar, Aug 1973, *Muffet M3/95* (CANB); Mt Kaputar N.P., *c.* 1.5 km from park entrance on road to Mt Kaputar, Oct 1989, *Jones 5182A* (CANB).

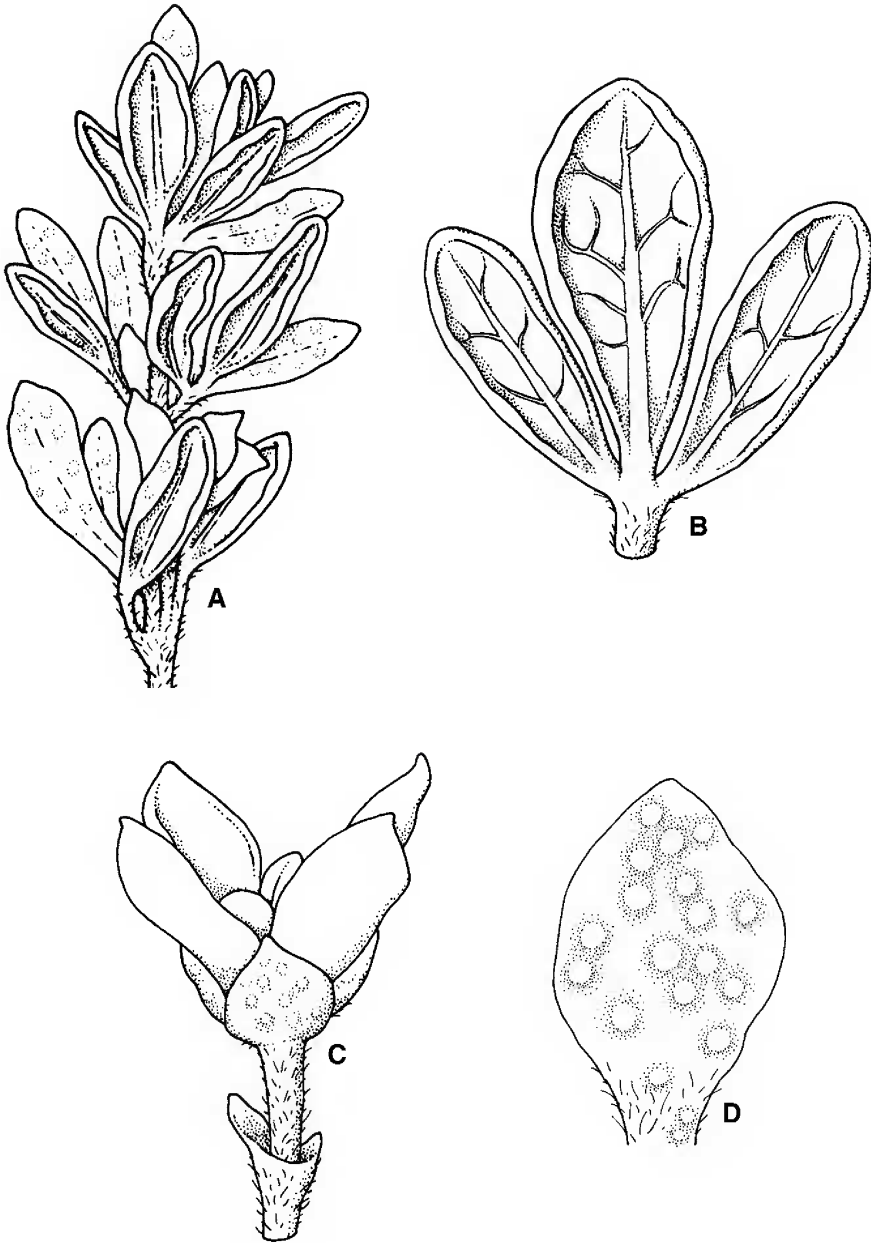
**Distribution and habitat:** *Zieria odorifera* subsp. *copelandii* is known only from Mount Kaputar N.P. It has been collected from rocky outcrops in heath with *Prostanthera cruciflora*, *Calytrix tetragona* and *Kunzea* sp.

**Phenology:** Flowers and fruits have been collected in October.

**Conservation status:** *Zieria odorifera* subsp. *copelandii* appears to be restricted to Mount Kaputar N.P. with collectors (*Copeland 3432*, *Jones 5182A*) noting that it was rare. Surveys are required to ascertain the size and extent of the known populations and the area of occupancy prior to ascertaining its conservation status. The restricted distribution would indicate that a status of at least Vulnerable based on the criterion D2 is warranted (IUCN 2001).

**Etymology:** The name honours Dr Lachlan Copeland, a botanist based in north-eastern New South Wales, whose collections have added much to the knowledge of the flora of New South Wales.

***Zieria odorifera* subsp. *warrabahensis*** Duretto & P.I.Forst., **subspecies nova** a subspecies typica indumento in caulibus sepalisque ex pilis praecipue stellatis constato (in illis ex pilis praecipue simplicibus vel bifidis constato) differt. **Typus:** New South Wales. NORTH WESTERN SLOPES: Warrabah National Park, 22 October 2006, *L.M.Copeland 4113* & *D.M.Raets* (holo: NE 88972; iso: BRI, CANB, HO, NSW).



**Fig. 1.** *Zieria odorifera* subsp. *copelandii*. A. branch with single flowering inflorescence  $\times 5$ . B. abaxial view of leaf  $\times 8$ . C. inflorescence with flower  $\times 12$ . D. adaxial view of petal  $\times 30$ . All from *Copeland 3432* (BRI). Del. B. Connell.

Erect shrub to 40 cm tall. Branches with a moderately dense indumentum of mainly stellate and some bifid hairs. Leaves sparsely pilose sometimes with hairs concentrated on midribs; petioles 1–1.5 mm long, glandular verrucose; terminal leaflets narrowly elliptic

to oblanceolate, 2.5–5  $\times$  1–3 mm, margins slightly to obviously glandular dentate, adaxial surface not glandular verrucose. Inflorescence usually longer than the subtending leaves, 1–3-flowered; peduncle 3–5 mm long, sparsely stellate hairy; pedicels 1–1.5 mm long, with



a sparse stellate indumentum. Sepals *c.* 1 × 1 mm, abaxial surfaces glabrous or with a sparse indumentum of minute stellate hairs. Petals *c.* 2.5 × 1.2 mm, adaxial surface sparsely pilose, abaxial surface with a dense stellate indumentum. Gynoecium glabrous. Cocci and seed not seen. **Fig. 2.**

**Additional specimen examined:** New South Wales. NORTH WESTERN SLOPES: Warrabah, W of Kingstown, Sep 1995, *Hunter 3590* (CANB, NE, NSW).

**Distribution and habitat:** *Zieria odorifera* subsp. *warrabahensis* is restricted to Warrabah N.P. where it is found growing in skeletal sandy soils over granite in herbland, heath, and woodland of *Eucalyptus prava* and *Callitris endlicheri*.

**Phenology:** Flowers have been collected in September and October.

**Conservation status:** Collectors have noted (*Copeland 4113*) that *Zieria odorifera* subsp. *warrabahensis* is occasional and localised in its distribution. Surveys are required to ascertain the size and extent of the known populations and the area of occupancy before providing an accurate conservation assessment. The highly restricted distribution would suggest that a status of Endangered may be warranted based on the criterion C2ii (IUCN 2001).

**Etymology:** This subspecies is named after the range it is apparently restricted to.

**Zieria odorifera** subsp. **williamsii** Duretto & P.I.Forst., **subspecies nova** a subspecies typica petalis brevioribus plerumque 2–2.5 mm longis (in illis plerumque 4–4.5 mm longis) differt. **Typus:** New South Wales. NORTHERN TABLELANDS: Oxley Wild Rivers National Park, 12 October 2002, *L.M.Copeland 3437* & *D.A.Carter* (holo: NE 80033A; iso: BRI, CANB, MEL, *K n.v.*, NSW).

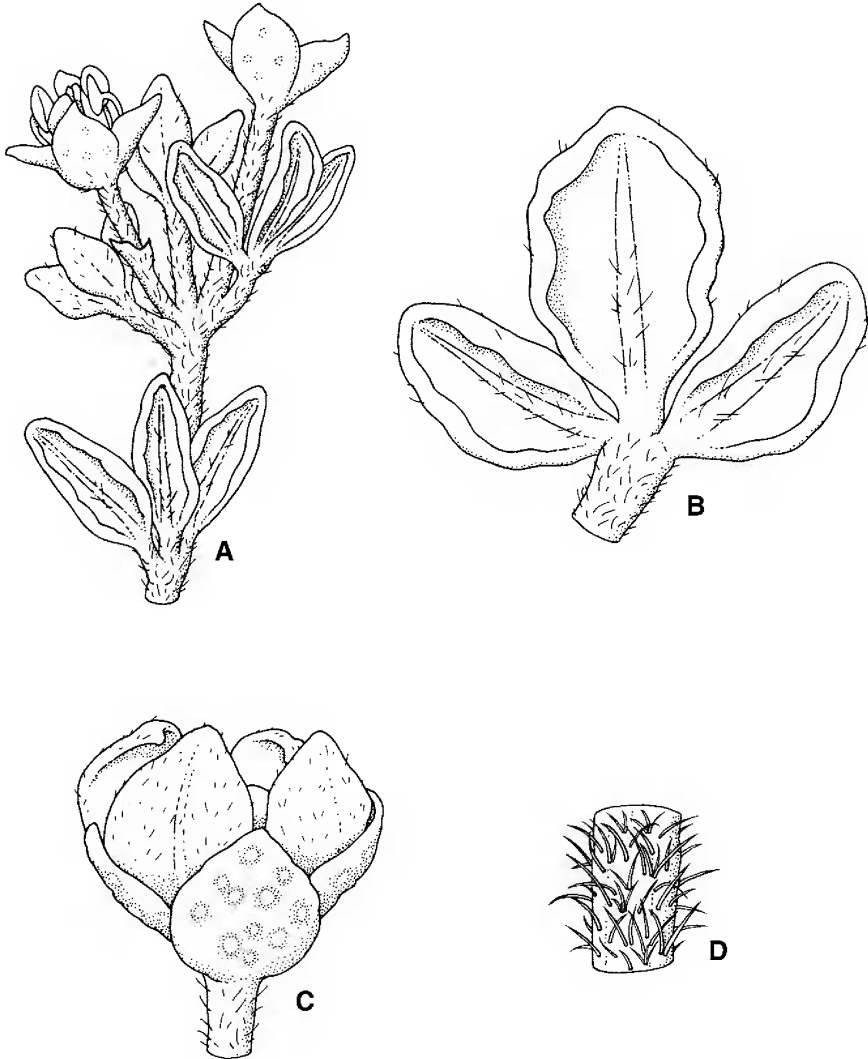
*Zieria* sp. ‘Cathedral Rock’ (J.B.Williams 95303); Armstrong & Harden (2002: 282)

*Zieria* sp. ‘Oxley Wild Rivers N.P.’ (Copeland 2174); Armstrong & Harden (2002: 283)

**Illustrations:** Armstrong & Harden (2002: 282, as *Zieria* sp. ‘Cathedral Rock’ (J.B.Williams 95303); 283, as *Zieria* sp. ‘Oxley Wild Rivers N.P.’ (Copeland 2174)).

Erect or rarely prostrate or spreading shrub to 0.5 m tall. Branches with a moderately dense to dense indumentum of mainly simple and bifid (occasionally trifid and stellate) hairs. Leaves sparsely to moderately densely pilose, sometimes hairs only on midribs; petioles 1–2 mm long, weakly glandular verrucose; terminal leaflets narrow elliptic to narrow oblanceolate, (3–) 5–10 × 0.7–2 mm, slightly or prominently glandular dentate, adaxial surface slightly to strongly glandular verrucose. Inflorescence shorter to slightly longer or rarely much longer (Copeton Dam area) than the subtending leaves, 1–3 (–12)-flowered; peduncle 1–4 (–6) mm long, with a moderately dense indumentum of mainly simple and bifid hairs; pedicels 1–3 mm long, with a moderately dense indumentum of simple, bifid hairs or stellate hairs. Sepals 1–1.5 × 0.7–1.3 mm, abaxial surfaces with a moderately dense simple and bifid indumentum sometimes with few stellate hairs. Petals 2–2.5 (–3.5, Copeton Dam area) × 1.2–1.5 mm long, adaxial surface sparsely pilose, abaxial surface with a moderately dense to dense indumentum of mainly stellate hairs. Gynoecium glabrous to hairy on outer margin. Cocci slightly glandular verrucose, glabrous to densely pilose. **Fig. 3, 4.**

**Additional specimens examined:** New South Wales. NORTHERN TABLELANDS: Sydenham near Barraba, Oct 1914, *Rupp s.n.* (NSW); Inverell, Aug 1910, *Boorman s.n.* (NSW); Goonooigall Bushland Reserve, near The Peaks, *c.* 6 km S of Inverell, Feb 1993, *Sipple 44* & *Beckers* (NE); Murchison S.F., W side of Copeton Dam, Feb 2001, *Copeland 2836* & *Westaway* (CANB, NE, NSW); 0.5 km N of Howell, Sep 1985, *Southwell H85-042* (CANB); 2.4 km from Howell on track to Copeton Lake recreation area, Sep 1985, *Southwell H85-039* (CANB); Copes Creek, S of Gilgai, Nov 1989, *Williams s.n.* (NE, NSW); Howell district, 70 km N of road to Copeton Dam, 8.4 km by road W of Inverell – Bundarra road, Oct 2001, *Copeland 3222* (CANB, NE, NSW); Howell, Aug 1905, *Boorman s.n.* (HO, CANB, MEL, NE, NSW); 2 km E of Howell, Sep 1966, *Williams s.n.* (NE50498A); 3 km E of Howell, Sep 1966, *Williams s.n.* (NSW651474, NE50532A); *ibid*, Dec 1971, *Williams s.n.* (HO544742, NE28958); 3.2 km E of Howell, Nov 1973, *Armstrong 683* (NSW); *ibid*, Dec 1971, *Williams s.n.* (HO, NE); 1 km S of Howell, Oct 1989, *Griffith & Williams s.n.* (NE); 2 km S of Howell, 1967, *Williams s.n.* (BRI [AQ510733], NSW651470); Single N.P., Mar 2000, *Copeland 2487* (NE, NSW); The Basin Nature Reserve, *c.* 20 km E of Bundarra, 2.8 km S of ‘Lutana’, Nov 2001, *Copeland 3260* & *Croft* (CANB, NE); Parlour Mountains, ‘Hardacres’ property, *c.* 38 km NW of



**Fig. 2.** *Zieria odorifera* subsp. *warrabahensis*. A. branch with several flowering inflorescences  $\times 8$ . B. abaxial view of leaf  $\times 10$ . C. lateral view of flower  $\times 20$ . D. indumentum on leaf bearing branchlet  $\times 20$ . All from *Copeland 4113* (BRI). Del. B. Connell.

Armidale, Aug 1991, *Hardaker s.n.* (NE); Snowy Range, Biffen's Block, 6.5 km WNW of Round Mt, Nov 1995, *Metcalf & Williams s.n.* (NE); The Pinnacle, 20 km W of Armidale, Jun 2007, *Telford 13165 & Bruhl* (HO, NE, NSW); The Pinnacle, 24 km W of Armidale, Oct 1975, *Wissman s.n.* (NSW); Biffen's property, Maiden Creek – adjoins western side of Cathedral Rock N.P., c. 15 km E of Wollomombi, Nov 1995, *Williams 95303 & Metcalf* (NSW); Oxley Wild Rivers N.P., Nov 1999, *Copeland 2174 et al.*, Nov 1999 (CANB, NE, NSW).

**Distribution and habitat:** *Zieria odorifera* subsp. *williamsii* is known from scattered populations between Inverell, Cathedral

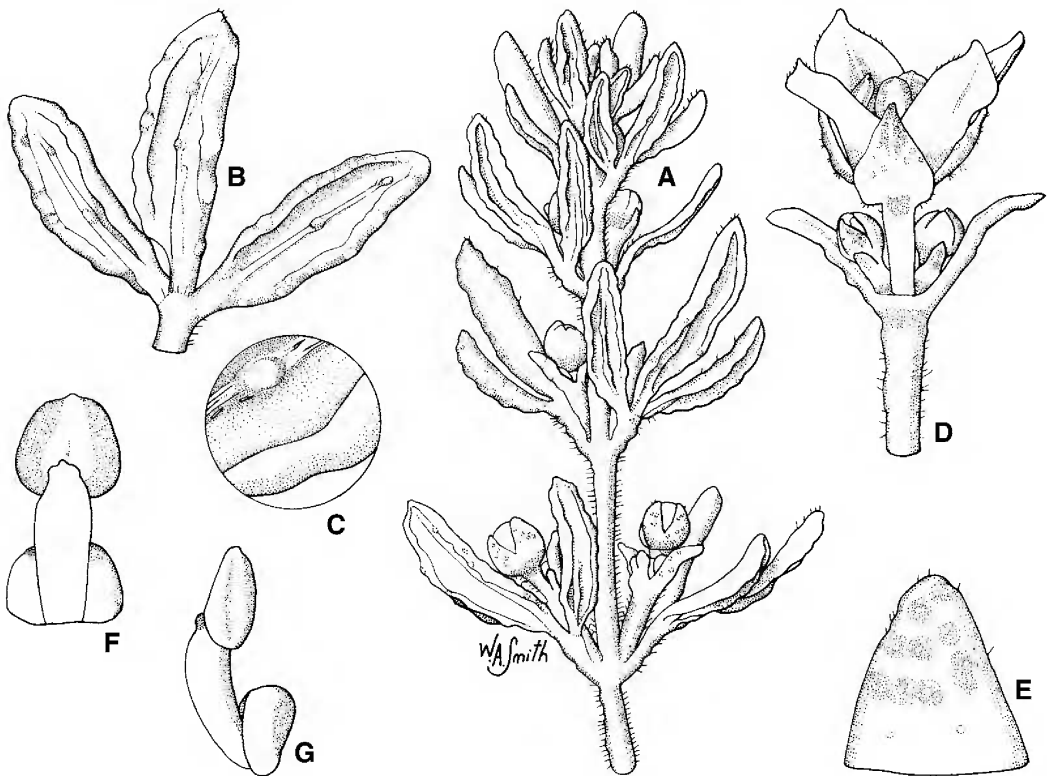
Rock N.P. and Oxley Wild Rivers N.P. It is found on various rock types including granite, porphyry and other volcanics in heath, shrubland (dominated by, e.g. *Acacia neriifolia*) and woodland (dominated by, e.g. *Eucalyptus prava*, *E. laevopinea*, *E. dealbata* or *Callitris endlicheri*).

**Phenology:** Flowers have been collected from August to November, and fruit from August to December (March, June).

**Notes:** *Zieria* sp. ‘Cathedral Rock’ (Williams 95303) and *Z.* sp. ‘Oxley Wild Rivers N.P.’ (fide Armstrong & Harden 2002) were separated from other species of *Zieria* on a few characters that included plant habit, inflorescence size relative to leaves, number of flowers per inflorescence and the pubescence of the cocci. These characters were found to be unreliable when a large number of collections were examined from the area between Howell and Cathedral Rock. Across the geographic range of *Z. odorifera* subsp. *williamsii* plants can have glabrous or hirsute fruit, and be erect, prostrate, ascending, etc.; thus these proposed diagnostic characters do not have much taxonomic relevance, they are simply variation. In addition, the collections from Howell that were included with *Z. odorifera* by Armstrong (2002) and Armstrong & Harden (2002) do not have petals *c.* 4.5 mm in length but *c.* 2.5 mm in length. *Zieria* sp. ‘Cathedral Rock’ (Williams 95303) and

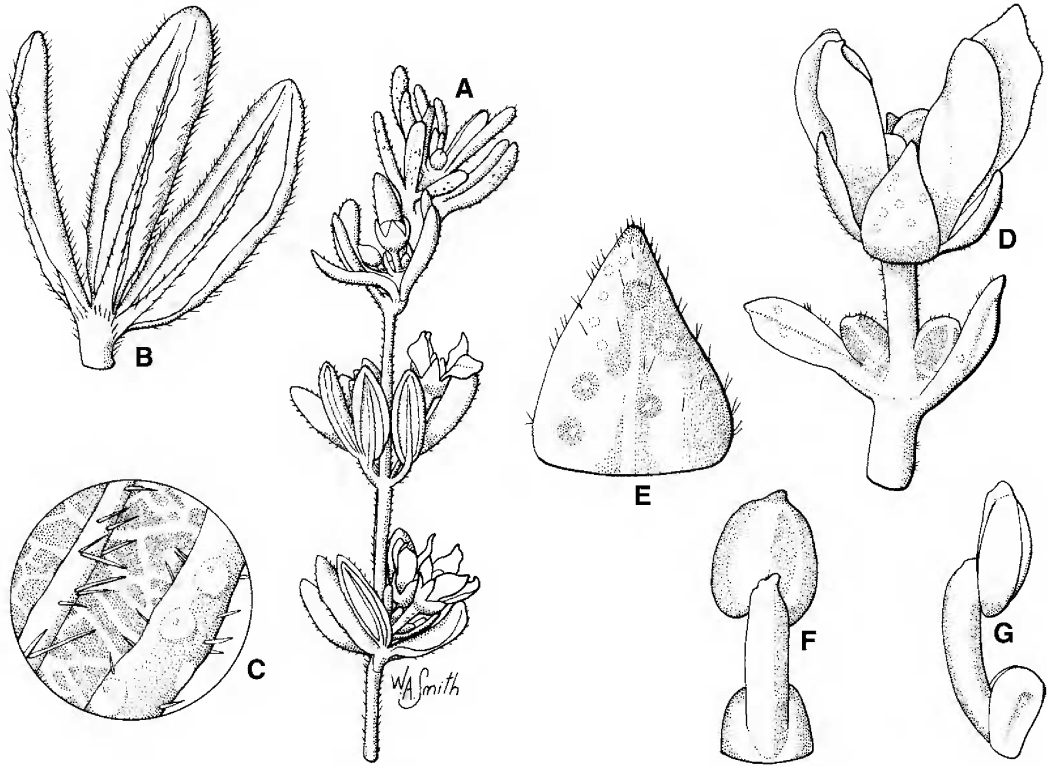
*Z.* sp. ‘Oxley Wild Rivers N.P.’ are based on a few specimens that are forms of the taxon recognised here which is variable in plant habit and in the amount of pubescence on the leaves and fruit (Fig. 3 & 4). The pubescence of the abaxial surface of the petals, and the composition of the indumentum is uniform and thus of taxonomic value for *Z. odorifera* (see key above).

Specimens from the Copeton Dam (e.g. Copeland 3222) and Inverell (e.g. Sipple 44 & Beckers) areas are almost intermediate between *Zieria odorifera* subsp. *odorifera* and the more ‘typical’ forms of *Z. odorifera* subsp. *williamsii* in that they have longer peduncles (to 6 mm long), inflorescences that are much longer than the leaves, larger petals (to 3.5 mm long) and leaves that are not always glandular dentate. These somewhat intermediate specimens are allocated with a little difficulty to the latter subspecies and



**Fig. 3.** *Zieria odorifera* subsp. *williamsii* (less hairy variant). A. branch with several flowering inflorescences  $\times 4$ . B. abaxial view of leaf  $\times 8$ . C. detail of abaxial leaf surface showing indumentum cover  $\times 20$ . D. inflorescence with flower and buds  $\times 8$ . E. tip of sepal  $\times 20$ . F–G. views of stamens  $\times 20$ . All from Copeland 3437 (BRI). Del. W. Smith.





**Fig. 4.** *Zieria odorifera* subsp. *williamsii* (more hairy variant). A. branch with several flowering inflorescences  $\times 2$ . B. abaxial view of leaf  $\times 6$ . C. detail of abaxial leaf surface showing indumentum cover  $\times 20$ . D. inflorescence with flower and buds  $\times 8$ . E. tip of sepal  $\times 20$ . F–G. views of stamens  $\times 20$ . All from *Williams s.n.* (BRI [AQ510733]). Del. W. Smith.

are one of the reasons why these taxa are being recognised at that rank. Field research with detailed population studies are required to determine if the variation seen on these few specimens is a true reflection of what is occurring *in situ*. Nevertheless outside these areas the smaller petals (2–2.5 mm long) and the narrow leaflets with glandular dentate margins easily separate *Z. odorifera* subsp. *williamsii* from the typical variety.

A putative hybrid between *Zieria odorifera* subsp. *williamsii* and *Z. cytisoides* (*Copeland 3439 & Carter*) has been collected in the Oxley Wild Rivers N.P. The single plant was isolated and plants of both parent species were present nearby (collector's notes).

**Conservation status:** In some areas collectors (e.g. *Copeland 3260*, *Williams 95303*) have indicated that this taxon is rare while elsewhere (e.g. *Armstrong 683*, *Telford 13165*) it was noted as being common though localised. It is

known from Oxley Wild Rivers and Cathedral Rock N.P.'s. Surveys are required to ascertain the size and extent of the known populations and the area of occupancy prior to ascertaining an appropriate conservation status, though it can be provisionally assessed as Endangered on the basis of criterion B2a,b(i–v) (IUCN 2001).

**Etymology:** This subspecies is named in honour of John B. Williams (1932–2005) who did much to advance Australian botany (see Bruhl *et al.* 2005).

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